

Prevalence and Pattern of Tobacco-associated Oral Lesion among Migrant Construction Workers in Chennai: A Cross-sectional Study

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Abstract Objectives: Tobacco use is a leading risk factor for oral potentially malignant and malignant lesions, particularly among low-income populations. Migrant construction workers represent a vulnerable group due to occupational stress, lack of healthcare access and socioeconomic challenges. This study examines the prevalence and patterns of tobacco-associated oral lesions in this demographic to inform targeted interventions and policy measures. **Methods:** A cross-sectional epidemiological study was conducted among 1,671 migrant construction workers in Chennai using a multi-stage cluster sampling technique. Data on demographic details, tobacco use (smoking and smokeless) and oral lesions were collected through questionnaires and clinical examinations, adhering to WHO guidelines. Statistical analysis, including logistic regression, was performed using SPSS version 22.0. **Results:** Among the participants, 84.8% used smokeless tobacco, while 15.2% were smokers. The prevalence of tobacco-associated oral lesions was 36.8%, with leukoplakia (8.6%) and oral submucous fibrosis (7.8%) being the most common. The buccal mucosa was the most affected site. Significant correlations were observed between tobacco use and lesion prevalence, with younger age groups (28–38 years) and males being the most affected. **Conclusions:** This study highlights the high prevalence of tobacco-associated oral lesions among migrant construction workers, emphasizing the need for targeted prevention programs. Recommendations include workplace-based tobacco cessation initiatives, regular oral health screenings and culturally sensitive awareness campaigns. Future studies should address long-term impacts, barriers to healthcare access and integration of findings into national oral health strategies.

Key Words Tobacco-associated lesions, migrant health, occupational health, oral cancer prevention, socioeconomic determinants

INTRODUCTION

Tobacco is widely recognized as a significant contributing factor to major non-communicable diseases (NCDs) identified by the World Health Organization (WHO), including cardiovascular diseases, cancer, chronic respiratory diseases and diabetes [1]. Nicotine substantially elevates the risk of developing oral cancer. In India, oral cancer accounts for approximately 30% of all cancer cases, with tobacco chewing (40%) and smoking (20%) being the primary contributors, making India one of the countries with the highest incidence globally [2]. Alarming, many individuals develop tobacco consumption habits, especially smoking, during their early teenage years [3]. WHO projections indicate that, if current trends persist, tobacco usage could result in the mortality of

250 million children and adolescents worldwide, particularly in developing countries [4].

India faces a significant public health burden due to the widespread use of tobacco [5]. In 2004, WHO estimated that 194 million men and 45 million women in India consumed nicotine, either through chewing or smoking [6]. Furthermore, WHO warned of a high mortality rate in the country due to tobacco-related NCDs, including cancer [7]. Smokeless tobacco, often perceived as more affordable and easier to conceal, is a major factor contributing to the high incidence of oral cancer in India [8].

The prevalence of various forms of tobacco usage varies significantly across Indian states, driven by cultural practices and economic factors [9]. This study focused on Chennai, a

metropolitan city comprising five zones, where tobacco-related health risks among migrant construction workers are notably high. Migrant workers often originate from regions with high tobacco consumption rates and upon migrating to urban centers, their usage may increase due to stress, social pressures and limited awareness about the associated health risks [10,11]. Additionally, financial constraints, language barriers and unawareness of healthcare resources further limit access to timely diagnosis and treatment for oral lesions, often exacerbating their severity [12,13]. Cultural norms and beliefs about tobacco use within migrant communities further influence the prevalence and patterns of oral lesions [14].

The burden of tobacco-related oral lesions has profound implications for public health, as it affects not only individual health but also workplace productivity and healthcare systems [15]. Studying the prevalence and patterns of these lesions among migrant populations in Chennai is critical for informing policymakers and healthcare providers about effective interventions. Tailored strategies such as tobacco control measures and oral health awareness programs could significantly mitigate these health risks [16]. Despite the existence of anti-smoking campaigns and mass media educational efforts through newspapers, television and radio, awareness of the health risks associated with tobacco use remains limited, particularly among low-income groups [17]. Factors such as socio-economic status, literacy levels, religious beliefs, psychosocial stressors, peer influence and celebrity endorsements contribute to the initiation and perpetuation of tobacco use [18,19].

While recent studies on tobacco-associated habits and oral lesions predominantly focus on young individuals, such as students and industrial workers in the tobacco sector, there remains a paucity of data on the prevalence among migrant construction workers [20]. Understanding the patterns of tobacco usage and associated oral lesions in industrial workers is crucial for shaping evidence-based public health policies [21].

This study aimed to investigate the prevalence of oral lesions associated with tobacco usage and their impact on morbidity, quality of life and mortality among migrant construction workers in Chennai. A multi-stage cluster sampling method was employed, beginning with geographic zones of Chennai segmented into five zones. Within each zone, industrial areas were identified as secondary clusters, followed by the random selection of industries as tertiary clusters to ensure a representative sample. Workers from each selected industry were chosen based on predefined inclusion criteria, enabling comprehensive coverage and minimizing selection bias in the study population.

METHODS

This cross-sectional study employed an epidemiological design to assess the prevalence and patterns of tobacco-related oral potentially malignant disorders (OPMDs) among industrial workers in Chennai, Tamil Nadu, from April 2023 to October 2023. The sample size was determined based on

the industrial worker population in the region, targeting 900 individuals with a 95% confidence interval and a 2% margin of error. To account for non-responses or exclusions, an additional 10% oversampling was planned, resulting in a total sample size of 1,000 participants.

Classification of OPMDs

For convenience, OPMDs were categorized into:

- **Tobacco-Related OPMDs:** Oral leukoplakia, erythroplakia, palatal changes associated with reverse smoking and oral submucous fibrosis.
- **Non-Tobacco-Related OPMDs:** Conditions such as oral lichen planus, oral lichenoid lesions, graft-versus-host disease, discoid lupus erythematosus, epidermolysis bullosa, dyskeratosis congenital and actinic cheilitis [22].

Diagnosis

Oral lesions were identified through comprehensive clinical examinations conducted by trained dental professionals, adhering to WHO guidelines for diagnosing oral mucosal lesions (22). To ensure diagnostic accuracy, all findings were validated by oral pathologists. In cases of diagnostic ambiguity, histopathological analysis was performed.

Data Collection

Participants completed a structured questionnaire capturing demographic details, tobacco use habits and alcohol history. Clinical examinations were conducted by a trained examiner with expertise in oral diseases. These included:

- **Extraoral Examination:** Lymph node palpation.
- **Intraoral Examination:** Detailed inspection of the oral cavity using diagnostic tools. For participants presenting observable mucosal changes, toluidine blue and acetic acid staining were used to detect OPMDs.

Inclusion Criteria

- Individuals aged 28 years and older.
- Participants who provided informed consent.
- Those available on the day of screening.

Exclusion Criteria

- Individuals with acute, painful lesions were excluded.

Data Analysis

The clinical data were digitized and analyzed using the Statistical Package for Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY). The following statistical analyses were conducted:

- **Descriptive Statistics:** Continuous variables were expressed as means, standard deviations and percentages.
- **Inferential Statistics:**
 - **Chi-Square Test:** Used to analyze group differences.
 - **Student's t-Test:** Assessed the mean exposure to tobacco habits.

- **Logistic Regression:** Examined the association between oral lesions and variables such as demographic factors, type of tobacco use and duration of use.
- **Confidence Intervals (CIs):** Prevalence rates and logistic regression results were reported with 95% CIs to provide a range for the true population values. Odds ratios (ORs) with 95% CIs quantified the strength of associations.

RESULTS

This cross-sectional study among industrial workers in Chennai utilized a WHO proforma to document tobacco-related habits and the prevalence of oral lesions. A total of 1,671 participants, aged 28 years and above, were included in the study, adhering to the predefined inclusion and exclusion criteria. Of these, 52.9% were male and 44.1% were female. The majority of participants were aged between 28 and 38 years, with the least representation from the 59-68 years age group. The average age of the participants was 36.95 ± 11.97 years.

A significant proportion of participants (84.8%) reported using smokeless tobacco, while 15.2% were smokers. The distribution of tobacco use showed significant variation by gender and age ($p \leq 0.001$). Among smokeless tobacco products, khaini was the most commonly consumed, particularly among younger age groups. Tobacco use, including both smoking and smokeless forms, was most prevalent in individuals aged 28 to 38 years. The mean duration of tobacco use was 20.23 ± 5.63 years, while the mean duration of alcohol consumption was 4.89 ± 1.59 years (Table 1).

The prevalence of tobacco-associated oral lesions was analyzed across various anatomical locations. The buccal mucosa was the most frequently affected site (101%), followed by the oral vestibule (84%), tongue and floor of the mouth (56%), inferior alveolar ridge mucosa (21%), palate (19%), lips (14%) and superior alveolar ridge mucosa (17%).

(19%), superior alveolar ridge mucosa (17%) and lips (14%), which were the least affected. Among the types of oral lesions observed, leukoplakia was the most common (104%), followed by oral submucous fibrosis (94%), palatal lesions (61%), erythroplakia (58%) and lichen planus (51%) (Figure 1).

The study also documented the types of tobacco products consumed by participants. Hans (201 participants) was the most frequently used form of tobacco, followed by khaini (198), beedi (146), paan masala (89), mawa (64) and other tobacco products (58). Alcohol consumption patterns revealed rum as the most consumed type (489 participants), followed by whiskey (57), spirit (34) and beer (21) (Figure 2).

Age and gender variations in the prevalence of oral lesions were notable. Participants in the 20-29 years age group exhibited the highest prevalence of oral lesions, including leukoplakia, oral submucous fibrosis and oral cancer (36.22%). These findings align with those of Mehrotra *et al.* (2010), which highlighted the early impact of tobacco use on the development of oral lesions. Males

Table 1: Represents the number of participants in each subgroup such as age, gender, tobacco status, alcohol status and presence of oral lesion

Characteristics	N (%)
Average age	
18-35	45.2 (45.2)
36-50	34.5 (34.5)
51-70	20.3 (20.3)
Gender	
Males	94.5 (94.5)
Females	5.5 (5.5)
Tobacco status	
Tobacco users	75.6 (75.5)
Non-tobacco users	24.4 (24.4)
Alcohol status	
Drinkers	60.1 (60.1)
Non-drinkers	39.9 (39.9)
Presence of oral lesion	
Oral lesion present	36.8 (36.8)
Oral lesion absent	63.2 (63.2)

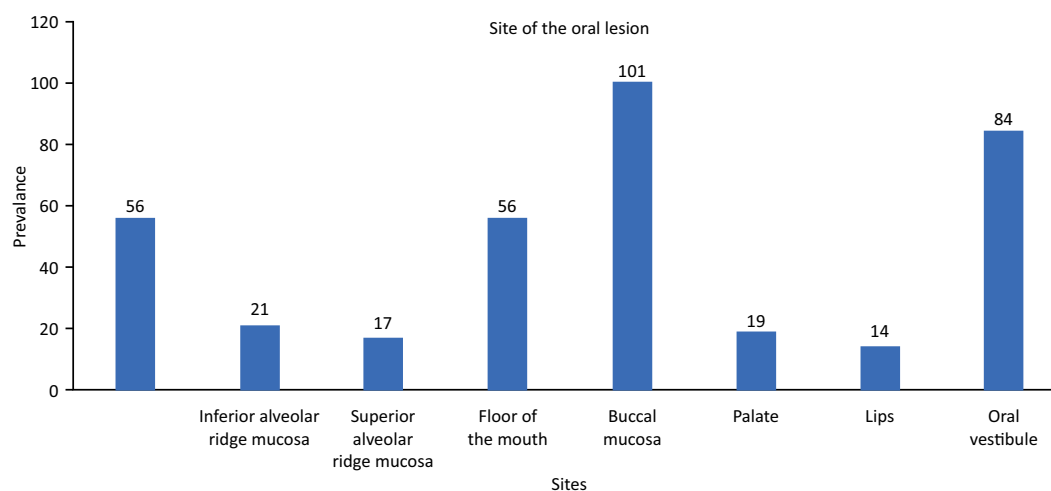


Figure 1: The bar chart represents the prevalence of occurrence of oral lesions in the tongue, inferior alveolar ridge mucosa, superior alveolar ridge mucosa, floor of the mouth, buccal mucosa, palate, lips and oral vestibule.

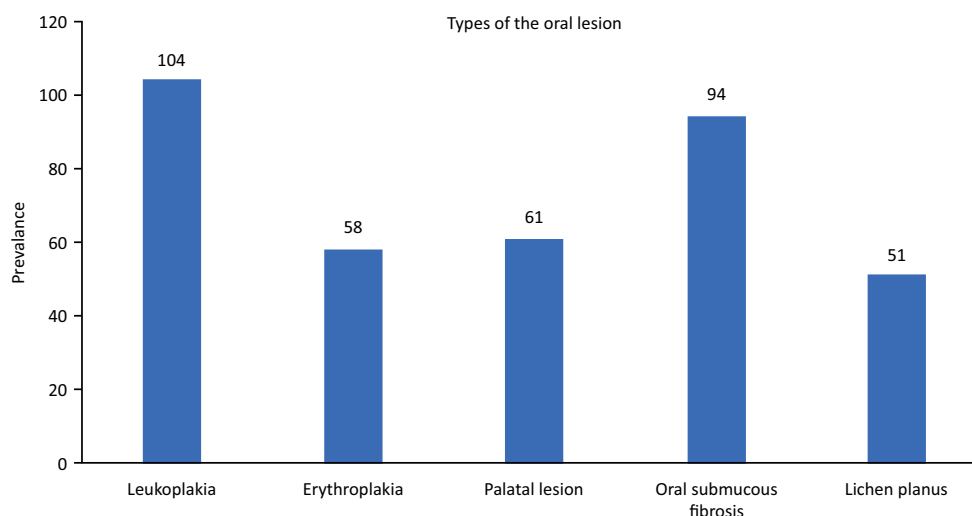


Figure 2: The bar chart represents the prevalence of occurrence of the types of oral lesions such as leukoplakia, erythroplakia, palatal lesion, oral submucous fibrosis and lichen planus.

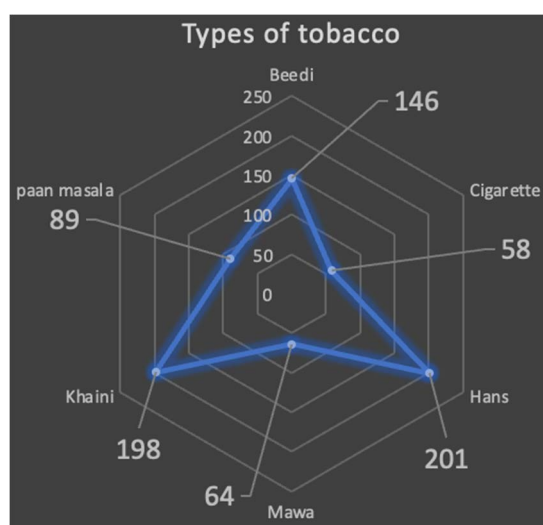


Figure 3: The chart represents the types of tobacco (Beedi, cigarette, Hans, mawa, khaini and paan masala) and the number of participants consuming them.

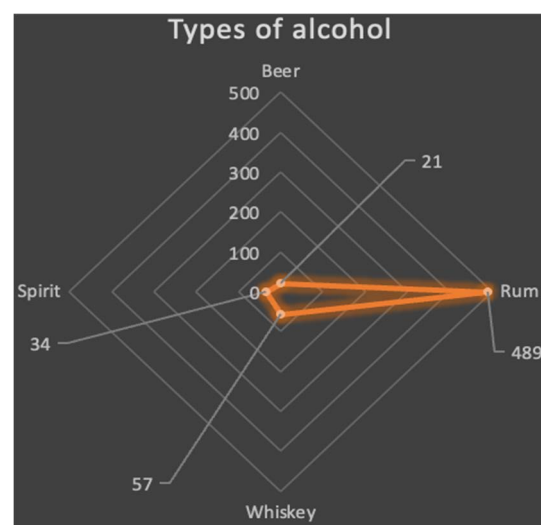


Figure 4: The chart represents the types of alcohol (beer, rum, whiskey and spirit) and the number of participants consuming them.

exhibited a higher prevalence of lesions such as leukoplakia and oral submucous fibrosis compared to females, potentially due to greater tobacco consumption rates. However, females demonstrated higher use of smokeless tobacco products, which are often consumed discreetly (Figure 3).

Long-term use of smokeless tobacco products such as Pan Parag, Gutka and Mawa was strongly associated with a higher prevalence of oral potentially malignant disorders (OPMDs). These findings are consistent with those of Chandra and Govindaraju (2012). Cigarettes were the most commonly used form of smoking tobacco, followed by filterless cigarettes. These results underscore the significant burden of

tobacco-related oral lesions among industrial workers in Chennai, emphasizing the need for targeted public health interventions (Figure 4).

DISCUSSION

This study observed a gender distribution of 94.5% males and 4.4% females, reflecting the predominantly male workforce in the industrial sector. These findings align with those of Gupta and Ray [23], who also reported higher male prevalence in similar studies (67.20% males compared to 49.80% females). The average age of participants in this study was 27.95 ± 11.97 years, with most participants falling

within the 20-29 years age group. This age distribution is consistent with a 2023 Indian study highlighting a higher prevalence of tobacco use in individuals aged 20-30 years [24].

The study documented that 86.8% of participants had smokeless tobacco habits, while 11.2% engaged in smoking tobacco. These findings are consistent with the ANDHRA PRADESH STUDY, which reported a similar tobacco smoking prevalence of 15%. However, other studies in Andhra Pradesh have noted significantly higher smoking prevalence rates of up to 67% [25]. These discrepancies may be attributed to the affordability and convenience of smokeless tobacco products, which are often more cost-effective than smoking options, particularly among industrial workers.

Interestingly, this study found a higher prevalence of smokeless tobacco use among females (99.78%) compared to males (75.70%), corroborating earlier research by Chang *et al.* [26]. This phenomenon could be explained by the social stigma associated with women smoking tobacco, leading them to prefer smokeless forms, which are easier to conceal and use discreetly in the oral vestibule. Additionally, the higher use of smokeless tobacco by women highlights the need for gender-specific interventions to address this health issue effectively.

The findings also suggest that men may be more vulnerable to psychological discomfort, financial strain and occupational stress, which can exacerbate tobacco use. Gender norms and societal expectations may further intensify the burden, leading to higher tobacco consumption among men. This study reinforces the dangers posed by smokeless tobacco products like Pan Parag, Mawa and Pan masala, which are strongly associated with oral submucous fibrosis and other potentially malignant disorders [27].

Limitations

This study has several limitations. As a cross-sectional analysis, it cannot establish causality between tobacco use and the development of oral lesions. The reliance on self-reported data introduces the potential for recall bias or underreporting, particularly regarding tobacco use and consumption habits. The focus on migrant construction workers limits the generalizability of findings to other population groups. Factors such as diet, alcohol consumption and oral hygiene, which may influence the results, were not accounted for. Furthermore, the clinical diagnosis of oral lesions relied on visual assessments, without histopathological confirmation, which could affect diagnostic accuracy. Sampling bias may have occurred due to the selection method and variations in tobacco products, smoking habits, or duration of use were not comprehensively explored. Finally, the absence of follow-up data prevents an evaluation of the progression of lesions or the effectiveness of potential interventions over time.

CONCLUSIONS

This study highlights the significant burden of tobacco-associated oral lesions among industrial workers, emphasizing the importance of early detection and prevention. Oral cancer, leukoplakia and oral submucous fibrosis were identified as critical early markers of tobacco use, while smoker's melanosis and pigmentation typically appeared later. Targeted preventative measures are urgently needed, including workplace-based smoking cessation programs, counseling services and initiatives to promote self-screening for oral precancer and cancer.

Interventions should focus on reducing both smoking and smokeless tobacco use in the workplace, raising awareness about the health risks associated with tobacco consumption and educating families about the dangers of tobacco-related oral lesions. Promoting general health and lifestyle changes will foster sustainable social improvements. These findings underscore the necessity of tailored public health policies and programs aimed at addressing the unique challenges faced by industrial workers, especially within the context of tobacco use and its associated health consequences.

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